March 2026

From One Brain To Another

> "Have you ever wondered how your brain works? We have, too. We'd like to share some information that may interest you, from our brains to yours!"

Welcome back to *From One Brain to Another*, a student-run neuroscience newsletter at York Univeristy, Toronto, Ontario, Canada. This newsletter is dedicated to its curious readers who would like to learn about the intricate, alluring discipline that is neuroscience. Included are student-written research review articles which discuss various topics within neuroscience in narratives reflecting other subjects, such as computer science, biology, and philosophy. We hope you may appreciate how interdisciplinary neuroscience is, and realize that there is room for everyone. This newsletter also serves as an opportunity for passionate students of all disciplines to obtain research experience and grow into becoming specialists of their fields. Information about programs, such as that of neuroscience, its faculty, ongoing research and opportunities at York University are sprinkled within these pages for the benefit of our audience and future students. **It should be noted that all articles and content contained within this issue are not to be taken as medical advice; the information is collected research communicated by students strictly for educational purposes.**

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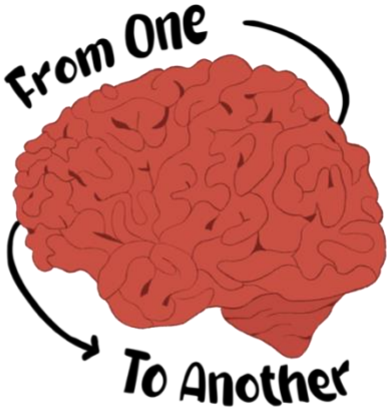
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Written by: Sadaf Yarmohammad | Edited by Jana Alagha

The Neurological Impacts of Meditation: A Comprehensive Exploration of Meditation and Its Influence on Amygdala Functionality

The 21st century has been an era defined by its unprecedented technological advancements, providing a means to revolutionize practical resources and influence societal progress and large-scale innovations. Although technological innovations have propelled society to unseen heights, widespread overstimulation has contributed to cognitive decline (Kershaw, 2023) and reduced mindfulness in an increasingly distracting world. As a result, society has united in its quest for solutions, driven to combat the technological age. Recently, it has sought neurological refuge in meditation.

Once primarily perceived as solely a spiritual and contemplative practice, meditation has now governed a large body of research in neuroscience dedicated to understanding its impact on brain structure, function, psychological mechanisms, and disease prevention (Brandmeyer et al., 2019). Contemplative practices continue to bring the observer into a state of self-actualization and enlightenment in spiritual traditions; however, from a clinical lens, meditation has also become an asset in investigating disease prevention (Innes et al., 2018).

This can be seen in a study conducted by Innes et al. (2018), where biomarkers of Alzheimer's disease, Telomere length (TL), telomerase activity (TA), and plasma amyloid-β (Aβ) levels in participants were assessed after two 12-week relaxation programs. The study results showcased that meditation was associated with changes in plasma Aβ levels, TL, and TA, fostering improvements in cognitive function, sleep, and mood (Innes et al, 2018). This multidisciplinary effort emphasizes the profound power of contemplative practices when addressing the various, complex challenges being faced by modern society, prompting an alternative approach to medical treatments through the usage of holistic and natural forms of remedy.

A study conducted by Kral et al. (2018) analyzed the effects of long and short-term mindfulness meditation practices on amygdala activity in a healthy, nonclinical population of adults reacting to emotional stimuli. The amygdala is an almond-shaped structure in the brain that is involved with emotions, such as fear. The participants in this study were divided into two groups:

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meditation-naïve participants (MNP) and long-term meditators (LTM). Functional magnetic resonance imaging (fMRI) was used to assess the neural activity of both groups while they viewed emotional stimuli. An fMRI is a neuroimaging technique used to detect changes in blood flow in the brain. The stimuli shown were pictures that would evoke either positive, negative, or neutral emotions.

Results indicated that long-term mediators showcased lower right amygdala reactivity in response to emotional pictures compared to meditation-naïve participants. This showcases that with increased meditative practices, the amygdala's activity for emotional stimuli can be reduced, decreasing overall emotional arousal in response to stimuli. This is beneficial as reduced emotional arousal in response to stimuli can lead to improved emotional regulation.

Heightened amygdala activation is associated with a plethora of psychiatric conditions, including post-traumatic stress disorder, social phobia, and specific phobia (Shin & Liberzon, 2009). These findings suggest that meditative practices can provide enhancement in emotional regulation and improve symptoms related to anxiety. However, it is essential to note that clinical psychiatric conditions involve an elaborate pathophysiology extending beyond amygdala functionality. This necessitates a need for further research to be done to determine whether reductions in amygdala activation resulting from meditative practices can meaningfully contribute to the treatment of psychiatric disorders.

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CIAN Seminars: Dr. Takashi Sato

Friday, January 9th, 2025

Written by Diana Salami

Debuting the CIAN seminars in the new year is Dr. Takashi Sato, with his talk on how optogenetic training facilitates stroke recovery. Early in his career, as a graduate student at Vanderbilt University, Dr. Sato focused on neural mechanisms underlying sensory and motor information processing. Moving from postdoctoral to assistant professor at Medical University of South Carolina, Dr. Sato's focus today is on circuit mechanisms mediating stroke recovery. His research on stroke management has clinical implications in promoting maximum patient recovery.

In his seminar, Dr. Sato highlights his use of optical approaches and behavioral paradigms to investigate sensory and motor interactions in the cortex. To reach his goal of stroke management, Dr. Sato observes the neural circuits involved in the voluntary movement of mice during a reaching task.

The task involves a thirsty mouse reaching for a water droplet with its right forepaw, grasping it, and guiding it toward its mouth. First, Dr. Sato closely observes how the layer V corticospinal neurons contribute to reaching without a stroke present. Results show that optogenetic suppression in the layer V neurons in the contralateral hemisphere (left hemisphere) decreases reaching performance. This indicates that those neurons are essential for reaching tasks, particularly in higher effort reaching tasks where their activity increases. When the optogenetic suppression is repeated, its effect becomes weaker. And at some point, the suppression has no effect on reaching behavior.

Secondly, Dr. Sato observes whether the corticospinal neurons contribute to stroke recovery. A stroke was induced in the left hemisphere of the mouse using protothrombosis-injecting a light-sensitive dye which disrupts local blood flow when illuminated. This method controls the size of the stroke by controlling the size of the light emitted. The stroke limits the mouse's ability to grasp with the right forepaw, but after rehabilitation, the motion is regained. Recovered forepaw movement followed by stroke is mediated by the contralesional motor cortex (in the right hemisphere), specifically when the lesion is large.

This explains the reduced effect of repeated optogenetic suppression. It is due to optogenetically induced interhemispheric plasticity and learning. The repetition induces axon sprouting into the ipsilateral (right) hemisphere, which can account for the function lost from the damaged motor area (in the left hemisphere).

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In the second half, Dr. Sato emphasizes that brain-body interaction maintains internal stability, shapes conscious experience, and helps us adapt to environmental stimuli. Once a receptor is activated by an external stimulus, the signal is detected by the pseudounipolar dorsal root ganglion (DRG). The signal ascends ipsilaterally until it decussates (crosses the midline), reaches the thalamus, and is sent to the cerebral cortex (Fig 2).

This dorsal column nuclei pathway carries highly localized and discriminative sensory information (ie. fine touch, proprioception) to the cortex. Neurons in the gracile nucleus are selective for proprioception or tactile stimulation in mice. This indicates that tactile and proprioceptive information are processed independently in the brainstem. Tactile-responsive and proprioceptive nuclei also remain segregated in the DRG and gracilis nuclei.

Overall, Dr. Sato demonstrates how circuit dynamics and plasticity underlie motor control and recovery following brain injury.

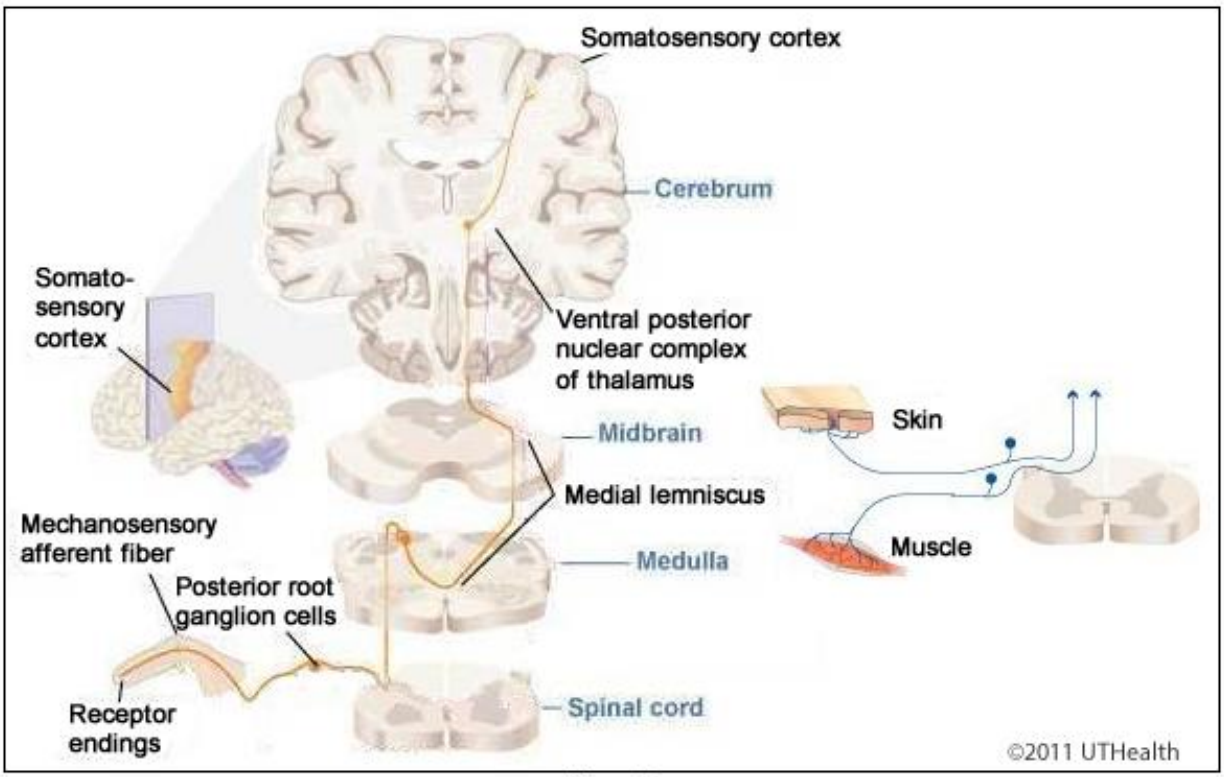


Figure 2

Dorsal column nuclei pathway

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CIAN Seminars: Dr. Kathryn Bonnen

Friday, January 23rd, 2025

Written by Valentina Dodaro

In this week's CVR seminar, Dr. Kathryn Bonnen presented her work on people's visual experiences in real-world settings. Dr. Bonnen is an assistant professor at the Indiana University School of Optometry. She earned her bachelor's degrees in psychology and computer science from Michigan State University as well as a Ph.D. in neuroscience from the University of Texas at Austin. Following this, she did a research fellowship at UC Berkeley and a postdoctoral at NYU. Her research focuses on visual perception, neural computation, and sensorimotor processing, with the goal of understanding how vision and movement function together in real-world tasks across the lifespan.

Dr. Bonnen discussed her research with both infant and adult groups. For infants, the research direction includes understanding the importance of visual stimulation during critical periods of development.

Two questions arise from this research:

(1) Is there a cardinal orientation bias present in typical early visual experience?

(2) What is the developmental trajectory of head movement and stability?

Cardinal orientation refers to horizontal and vertical edges. It is seen that infants have a bias toward these edges, likely because they are overrepresented in natural visual scenes. Similarly, adults experience the oblique effect, where they perform better in perceptual tasks at horizontal and vertical orientations compared to oblique orientations. The cardinal bias increases during the first weeks of life and is fully present at 13 weeks, while head rotation and stability increases over the first two years of life as overall head rotation varies across development.



Dr. Kathryn Bonnen

Photo Credit: Denz Marieon Pasion

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Additionally, learning to walk skyrockets the stability in head rotation. For adults, the Bonnen Lab studies how vision supports their locomotion, particularly walking. The lab conducts a visually guided walking experiment in natural environments and uses eye tracking, machine learning, and environmental reconstruction to link gaze and locomotion. The conclusion is that visually guided walking is not a single task, rather it is a sequence of decisions and a collection of tasks.

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Opportunities and Events at York University

CIAN – Centre for Integrative and Applied Neuroscience:
A neuroscience research group at York University; its aim is to collaborate as a unit on subjects including, but not limited to health, education, and the industry.

Upcoming Seminars: (Kaneff Tower, Room 519)

- **Friday, March 6th, 2026 @ 2:00pm-3:30pm** | Dr. Dan Yamins, Stanford University

CVR – Centre for Vision Research:
York University's specialized vision research organization that comprises of leading scientists and professionals who aim to conduct ground-breaking research and further develop training in this field.

Upcoming Seminars: (Kaneff Tower, Room 519)

- **Friday, March 13th, 2026 @ 2:00pm-3:30pm** | AGM
- **Friday, March 20th, 2026 @ 2:00pm-3:30pm** | Dr. Fred Kingdom, University of Toronto
- **Friday, March 27th, 2026 @ 2:00pm-3:30pm** | Dr. Stella F. Lourenco, Emory University

Seminars are accessible to the general public; anyone is welcome to attend these lectures and ask questions.

Neuroscience Society at York University:



Women in STEM Mentorship Program



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This month's article, and the newsletter itself, would not have been made possible without the help of the following intelligent, talented, and passionate individuals who have dedicated time to present their original work and support the development of this month's issue. If you are interested in joining our team as we develop our issues for May 2026 and further, please access the google form on our website here. Members of all disciplines and backgrounds are welcome to take part in this initiative.

Diana Salami, Author Hons., BSc, Neuroscience, York University	Lana Petros, Visual Media Designer Hons., BSc, Biomedicine, York University
Denz Marieon Pasion, Head of Photography Hons., BSc, Biomedicine, York University	Nicole Pitkis, Head of Visual Media Hons., BSc, Biology, University of Guelph
Dr. Peter Kohler, Supervising Staff Faculty Full Professor, York University	Sadaf Yarmohammad, Author Hons., BSc, Neuroscience Program, York University
Hana Sopel-Mizrahi, Founder Hons., BSc, Neuroscience, York University	Valentina Dodaro, Head of Seminars and Events Hons., BSc, Neuroscience, York University)
Jana Alagha, Head Editor Hons., BSc, Neuroscience, York University	Lana Petros, Visual Media Designer Hons., BSc, Biomedicine, York University

March 2026 Cover Page designed by Lana Petros.

Logo designed by Nicole Pitkis.

CVR Seminar Photography captured by Denz Marieon Pasion

Neuroscience Society at YorkU Media illustrated by Allegra Favaretto

Women in STEM Mentorship Program logo supplied by co-presidents Sabrina Carpino and Sophia Peristeris

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